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PRELIMINARY STUDIES
AND REPORT

EXISTING NOISE LEVELS IN THE VICINITY OF THE URLIN AVENUE INTERCHANGE MISSOULA, MONTANA

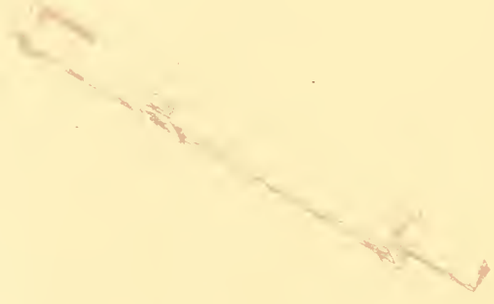
FOR

MONTANA HIGHWAY COMMISSION

HELENA, MONTANA

PROJECT NUMBER
275-13-01

SET NUMBER
4



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REPORT

ON

EXISTING NOISE LEVELS

AT THE VICINITY OF THE

URLIN AVENUE INTERCHANGE

MISSOULA, MONTANA

For

MONTANA HIGHWAY COMMISSION

HELENA, MONTANA

Prepared By

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NOISE SURVEY REPORT

1.01 PURPOSE:

The purpose of this survey and report is to establish a record of the character and intensity of vehicular noises near the Northern Pacific Hospital Building in Missoula, Montana. This record is typical of the noises that are now and have been occurring prior to the construction of Interstate Highway 90.

Interstate 90, which is now under construction will be located approximately one block north of the Hospital. An interchange, known as the Urlin Avenue Interchange will be constructed at the intersection of Urlin Avenue and the Interstate Highway. Urlin Avenue is an arterial street located immediately West of the Hospital and presently has a reported high volume of truck traffic.

If future conditions require, the results of this survey may be compared with future noise levels occurring after the completion of the new Interstate Highway and Urlin Avenue Interchange.

1.02 SURVEY PROCEDURES:

A. Personnel: All testing was performed by Thomas G. Morrissey, a registered Professional Engineer from the State of Colorado. Mr. Morrissey is a graduate electrical engineer, and has over fifteen years experience in the field of acoustical engineering. He is presently an Acoustical Consulting Engineer associated with the firm of Swanson-Rink & Associates, Consulting Engineers from Denver, Colorado.

On May 18 and 19, 1965, he was assisted by James G. Harrington, a project engineer with Morrison-Maierle, Inc. in Helena, Montana. Mr. Harrington observed the equipment being used, the locations where noise was measured, and assisted Mr. Morrissey in setting up and calibrating equipment.

B. Equipment: Test equipment employed for this survey is listed below. This equipment is made specifically for the measurement of sound by the General Radio Company. The secondary calibration unit was checked shortly before the measurements were made by the manufacturer's laboratory.

Equipment	Type
Sound Level Meter	1551 A
Octave Band Analyzer	1550 A
Graphic Level Recorder	1521 A
Sound Level Calibrator	1555 A
Transistorized Oscillator	1307 A

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Results of the survey were recorded by two different methods. The first method was to visually read noise levels on the Sound Level Meter, and record them in a field note-book. The second method was to use the Graphic Level Recorder in combination with the Sound Level Meter. The latter method records noise levels with respect to time on a roll of graph paper, thereby providing a permanent record of the noise level.

C. Recording Procedures: Recordings were made during the period May 18 through May 20, 1965. The recordings were made over the period of successive days to avoid any peculiarity of a particular day. The recordings were made on a Monday afternoon, all day Tuesday, and a Wednesday forenoon.

The sound measuring instruments were calibrated at the site, using portable secondary standards. Several times each day, the calibration of the sound measuring equipment was checked to indicate error. None occurred.

D. Equipment Location: On arrival at the hospital grounds on May 18, 1965, a preliminary evaluation of the various vehicle noises occurring around the hospital was made. From this preliminary evaluation, three locations were selected for the pickup microphone. These locations were:

(1) Nine (9) feet south and twenty feet (20) west of the southwest corner of the hospital, and forty (40) inches above the ground. This location had the highest traffic noise.

(2) Forty (40) feet north and forty-five (45) feet west of the northwest corner of the hospital, and forty (40) inches above the ground. At this location, traffic noise was almost as loud as the #1 location, but it was nearer to the future highway interchange ramps.

(3) A location on the fourth floor balcony of the hospital near the northeast corner was the final location used.

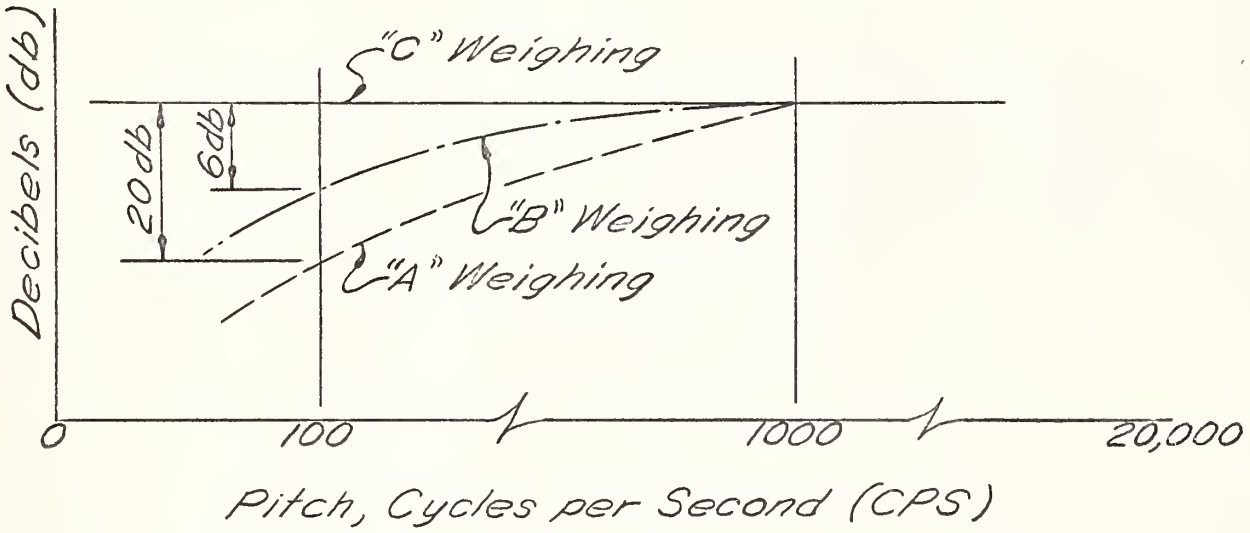
A sketch showing the approximate location of the hospital and microphone locations with respect to Urlin Avenue and the Interstate Highway is included as an appendix to this report.

1.03 SURVEY RESULTS:

A. General: The results of the noise survey report are presented in "Table A" and Charts 1 through 7." The noise levels were recorded and tabulated under a "Weighing 'A', 'B' and 'C'." These "Weighings" provide standard amounts of frequency correction, the effect of which is similar to adjusting the "tone" control on a radio. The purpose of the "Weighings" is to make the sound meter respond somewhat like the

typical human ear. The human ear hears the louder sounds with equal response to high and low pitch ("C Weighing"), but with less response to low pitch when the loudness decreases ("B and A Weighing"). Some authorities believe that "A Weighing," which de-emphasizes low frequency response to 1/10th (minus 20 decibels at 100 cycles per second in reference to 1000 cycles per second), gives a more representative indication of the loudness of sounds in general.

The relationship between the different "weighings" is shown graphically below.



"A" Weighing de-emphasizes 100 CPS approximately 20 db.
"B" Weighing de-emphasizes 100 CPS approximately 6 db.
"C" Weighing provides uniform response, 20 to 10,000 CPS.

B. Table A: The following sound levels in decibels were measured with a calibrated General Radio Sound Level Meter, Type 1551A, and are representative of the louder noises which were graphically recorded during the survey made May 18-20, 1965. The table was compiled from field notes, and shows the sound levels under different circumstances.

The pickup microphone locations #1, #2 and #3 are as described in paragraph 1.02 D and are shown in the sketch in Appendix 1.

TABLE A

Time	Location	Source of Noise	Sound Levels (Decibels) "Weighing" A	B	C
3:15 PM	#1	General background (quiet)	44/46	50/52	55/60
3:30 PM	#1	Routine Traffic on Urlin Avenue	60/65	70/75	75/80
4:00 PM	#1	Railroad Train, 1½ blocks South	50/55	60/65	70/75
3:10 PM	#2	Log truck, northbound on Urlin Avenue	-	-	85
11:20 AM	#3	Routine traffic on Urlin Avenue	60/65	65/70	70/75

From the above table, it can be seen that the routine traffic on Urlin Avenue has a noise level approximately 17 db to 20 db higher than the general background noise level, depending on "weighing" and equipment location. The railroad train recorded had a noise level approximately 7 db to 15 db higher than the general background noise level, depending on the weighing used. A logging truck recorded at location #2 had a noise level approximately 27 db greater than the background noise level and approximately 8 db greater than the routine traffic noise level on the "C" Weighing. Higher noise levels than the 85 db were recorded graphically and are discussed in the following section of the report.

C. Charts 1 through 7: Charts 1 through 7 are reproductions of some of the actual field recordings made. These charts show the variation of sound intensities with time as different types of vehicles passed the hospital grounds. The intensity scale is in decibels, and each chart contains the calibration as it was checked during the recording of the signals from the sound level meter.

Other items noted on the charts are:

1. Pen Speed
2. Chart Speed
3. Location
4. Weighing
5. Date and Time
6. Description of unit creating noise.

These charts are a sampling of the field recordings made. The remainder of the recordings are being maintained in the files of Swanson and Rink in Denver.

Chart 1 was recorded at 5:10 P.M. on May 18 using a "C Weighing." During this period, the minimum noise level recorded was approximately 62 db, and the peak noise level recorded was approximately 96 db, caused by a truck turning east on 2nd Avenue from Urlin. These levels are approximately 7 db and 39 db higher respectively than the general background noise level of 57 db.

Chart 2 was recorded at 10:00 A.M. on May 19 using a "C Weighing." During this period, the minimum noise level recorded was approximately 60 db, and the peak noise level recorded was approximately 89 db, caused by a northbound truck on Urlin Avenue. These levels are approximately 3 db and 32 db higher respectively than the general background noise level of 57 db.

Chart 3 was recorded at 11:30 A.M. on May 19, using a "C Weighing." During this period the minimum noise level recorded was approximately 64 db, and the peak noise level recorded was approximately 93 db, caused by a truck northbound on Urlin Avenue. These levels are

approximately 7 db and 26 db higher respectively than the general background noise level of 57 db.

Chart 4 was recorded at 12:30 P.M. on May 19, using a "C Weighing." During this period the minimum noise level recorded was approximately 64 db, and the peak noise level recorded was approximately 92 db, caused by a lumber truck and a tow truck northbound on Urlin Avenue. These levels are approximately 7 db and 25 db higher than the general background noise level of 57 db.

Chart 5 was recorded at 2:55 P.M. on May 19, using a "C Weighing." During this period, the minimum noise level recorded was approximately 73 db and the peak noise level recorded was approximately 100 db, caused by a logging truck northbound on Urlin Avenue. These levels are approximately 16 db and 43 db higher respectively than the general background noise level of 57 db.

Chart 6 was recorded at 10:05 A.M. on May 20 using an "A Weighing." During this period, the minimum noise level recorded was 56 db, and the peak noise level recorded was 90 db, caused by a logging truck northbound on Urlin Avenue. These levels are 9 db and 43 db higher respectively than the general background noise level of 47 db.

Chart 7 was recorded at 11:55 A.M. on May 20, using a "C Weighing." This recording was made of the general traffic on Urlin Avenue, and the noise levels during this period varied from approximately 60 db to 80 db. These levels are approximately 3 db to 23 db higher than the general background noise level of 57 db.

1.04 CONCLUSIONS & RECOMMENDATIONS:

The study of the noise levels existing in the vicinity of the Northern Pacific Hospital and Urlin Avenue Interchange during the period of May 18-20, 1965 has revealed the following:

(1) Background noise levels vary from 44 to 60 decibels, depending on the weighing used.

(2) Routine traffic noise levels on Urlin Avenue vary 60 to 80 decibels, depending on the weighing used. The noise level from the routine traffic averages about 20 decibels higher than the background noise.

(3) Truck traffic noise levels on Urlin Avenue vary from 90 to 100 decibels, depending on the weighing used. This noise level averages about 45 decibels higher than the background noise, and about 25 decibels higher than the routine traffic noise.

Whether or not the noise levels recorded are objectionable is beyond the scope of this report. However, due to the way a person adjusts to his surroundings, the difference between the background noise level and the peak noise levels becomes important. Using arbitrary values, let us assume that a peak noise level is 80 decibels. If the normal background noise level is 70 decibels, then the increase in noise level would probably not be noticed. However, if the background noise level was normally 20 decibels, then the increase of noise level by 60 decibels would probably be noted, and cause complaints.

Should complaints be made in the future due to noise from the Interstate Highway, we recommend that the noise levels in this report be compared with a study of noise caused by traffic on the Interstate Highway. Any future study should measure:

(1) Background noise level
(2) Routine traffic noise level
(3) Truck traffic noise level

From the comparison of noise levels existing before construction of the Interstate Highway with those existing after construction of the highway, your attorneys and engineers should be able to determine if any appreciable change has occurred.

N

SCALE 1"=50'

"NOTICE"

THIS SET OF PLANS HAS BEEN REDUCED TO ONE HALF SIZE MODIFY SCALES ACCORDINGLY

NOTES

3 ● INDICATES LOCATIONS OF SOUND METERING EQUIPMENT PICKUP MICROPHONE.

SOUND LEVEL STUDY WAS MADE MAY 18-20 1965. INTERSTATE HIGHWAY LOCATION WAS MADE FROM HIGHWAY DEPARTMENT PLANS

HIGHWAY CONSTRUCTION STARTED IN JUNE 1965

URLIN AVENUE INTERCHANGE

MISSOULA, MONTANA

Drawn THJ Checked JHM Approved JHM Date 11-5-65	LAYOUT PLAN	SHEET NO 275-13-01 APPENDIX 1

MORRISON-MAIERLE, INC.
CONSULTING ENGINEERS
HELENA BILLINGS MONTANA